Marine Life Protection Act Initiative

Draft Spatial Bioeconomic Model Evaluations of Round 2 MPA Proposals

Presentation to the MLPA Master Plan Science Advisory Team

June 18, 2009 • Los Angeles, CA

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Model Inputs

- Geographic
  - Habitat maps
  - Proposed marine protected area (MPA) boundaries and regulations
- Species-specific
  - Life history (growth, natural mortality, fecundity)
  - Adult movement (home range diameter)
  - Larval dispersal (pelagic larval duration, spawning season, some behavior)
  - Dispersal patterns from University of California Los Angeles (UCLA) / University of California, Santa Barbara (UCSB) circulation model
  - Egg-recruit or settler-recruit relationship (critical to population persistence)

Updates to Model Inputs

- Substrate map
  - Uses combination of high- and low-resolution habitat data, and kelp data to reflect the best available indication of hard habitat in each location
- Fishing fleet model
  - Original model: Fleet responds to spatial abundance of fish
  - Updated model: Based on data compiled by Ecotrust
  - Updated model: Fleet responds to
    1. spatial abundance of fish
    2. distance from port
    3. higher effort further south in study region (University of California, Davis – UCD – model only)

Model Inputs: Species

- Ocean Whitefish
- Black Surfperch
- Opaleye
- Kelp Bass
- Kelp Rockfish
- California Sheephead
- California Halibut
- Red Sea Urchin

Model Outputs

- **Conservation**
  - Spatial distribution of larval settlement and biomass
  - Total settlement and biomass (summed over study region, weighted sum across species)
- **Economic**
  - Spatial distribution of fishery yield
  - Total fishery yield (summed over study region, weighted sum across species)

Model Outputs

- **Other Data**
  - Spatial distribution of fishing effort
  - Larval connectivity patterns
- *All outputs are based on long-term equilibria*
- *Each output is calculated for a range of assumptions about future fishery management outside MPAs*[1]

[1]For complete list of assumptions, see evaluation methods document for the MLPA South Coast Study Region, Chapter 8, Appendix B.

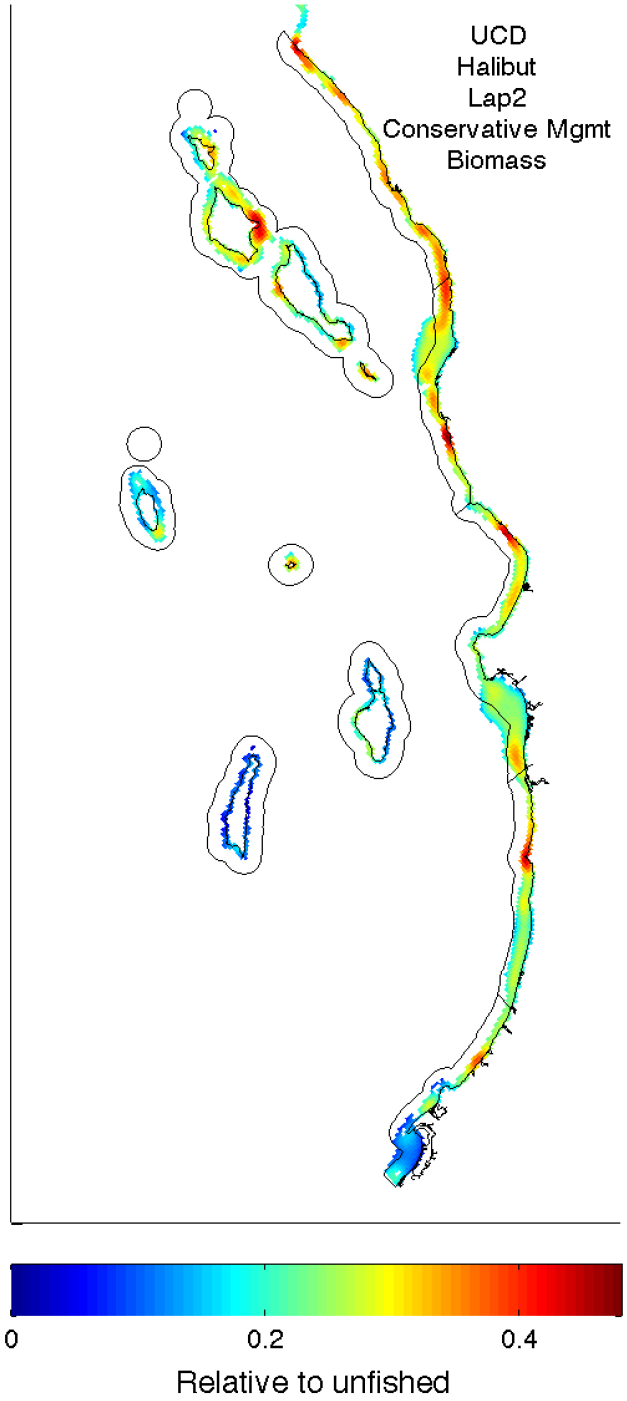
Model Results

Spatial Distribution of Biomass

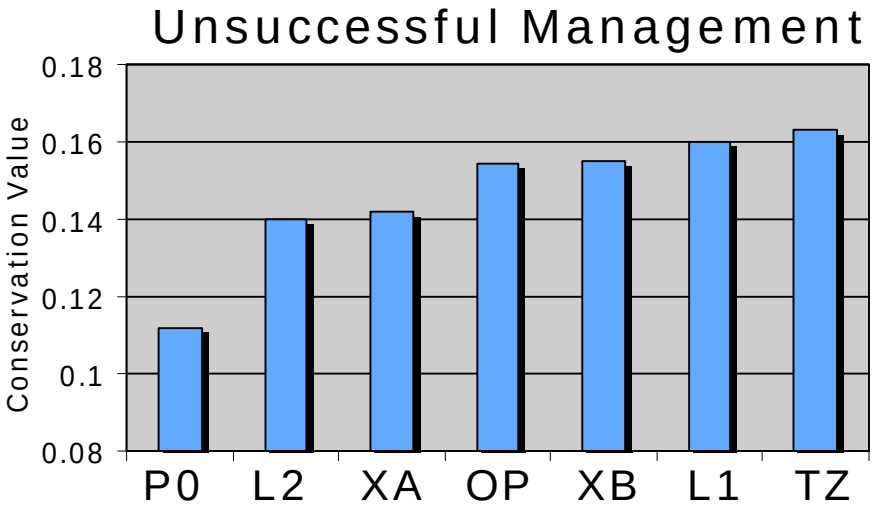
(Maps also available for recruitment, fishery yield and fishing effort)

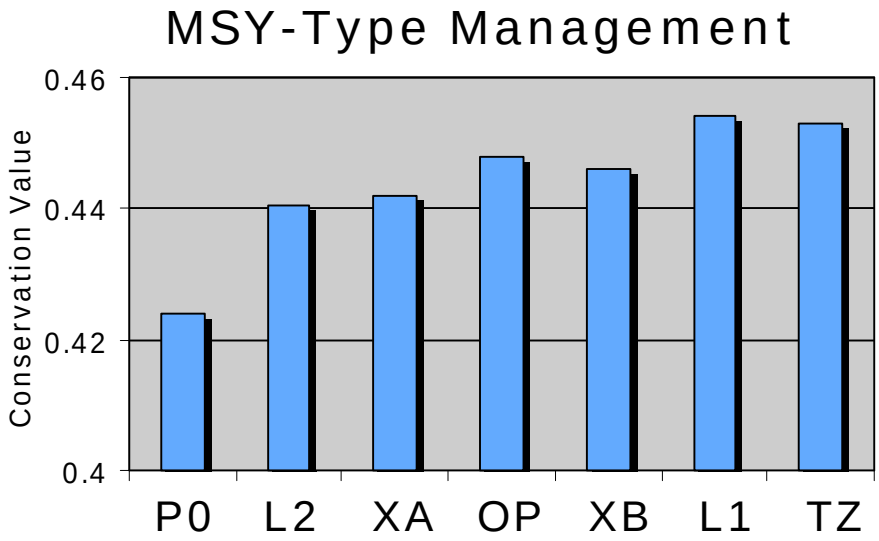
- **Example species**: Halibut
- **Example proposal**: Lapis 2
- **Management assumption***: Conservative management outside MPAs

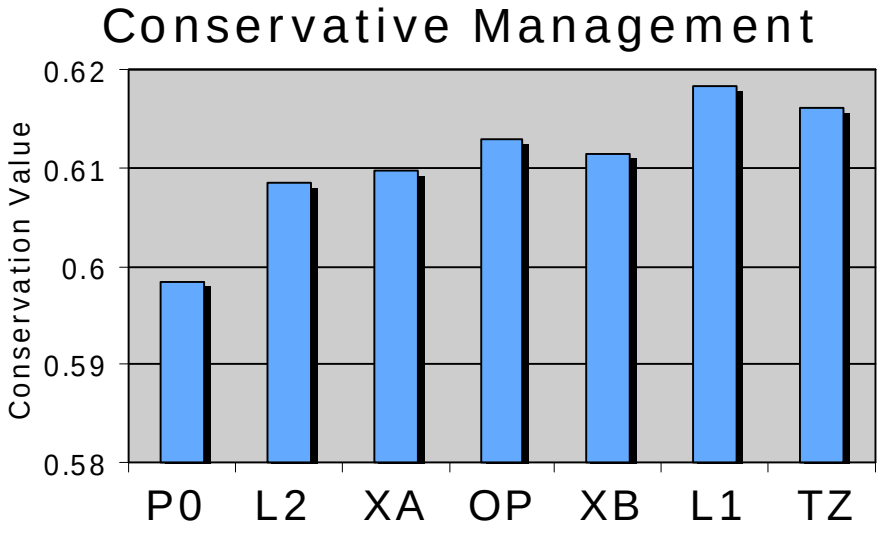
*Also run for “unsuccessful management” and “Maximum Sustainable Yield” (MSY-type) management



Model Results: Proposal Rankings



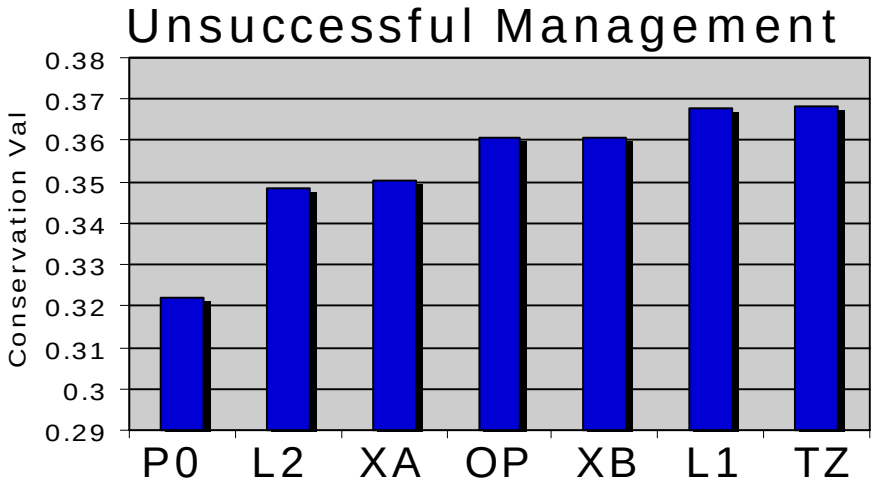


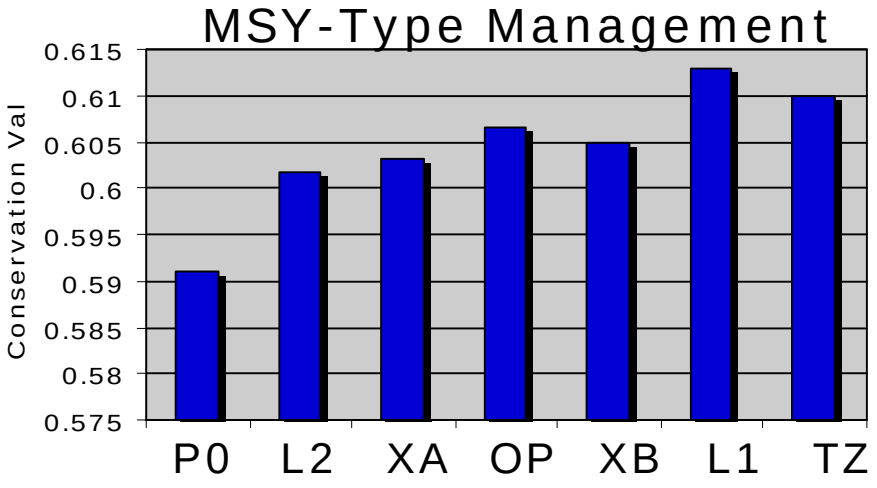


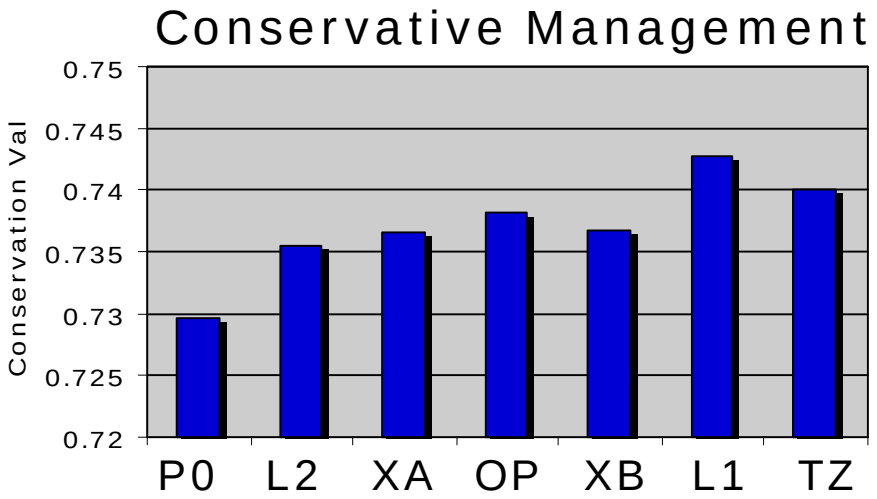
Ranking for conservation value (nearly) preserved across fishing scenarios and models

Model Results: Proposal Rankings

New Fleet Model - UCSB

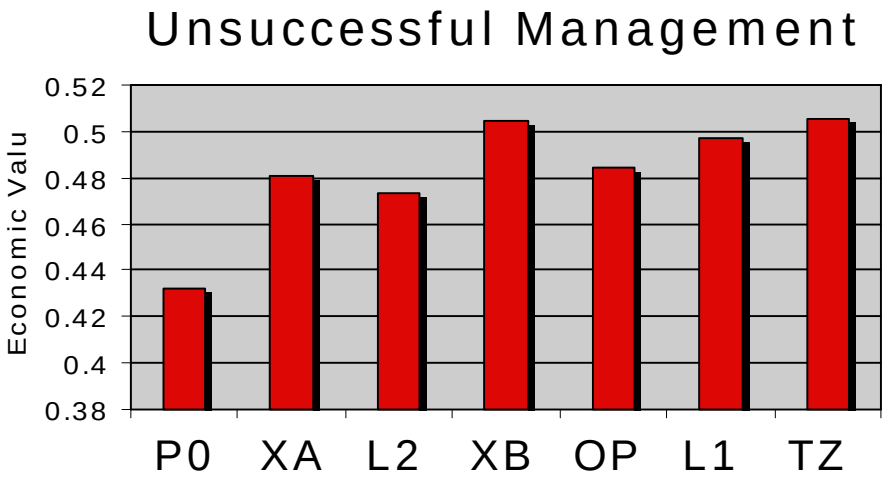


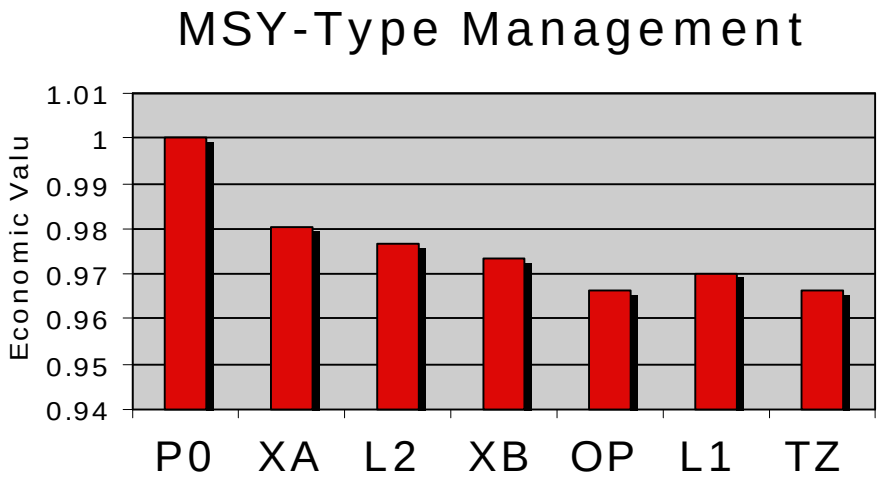


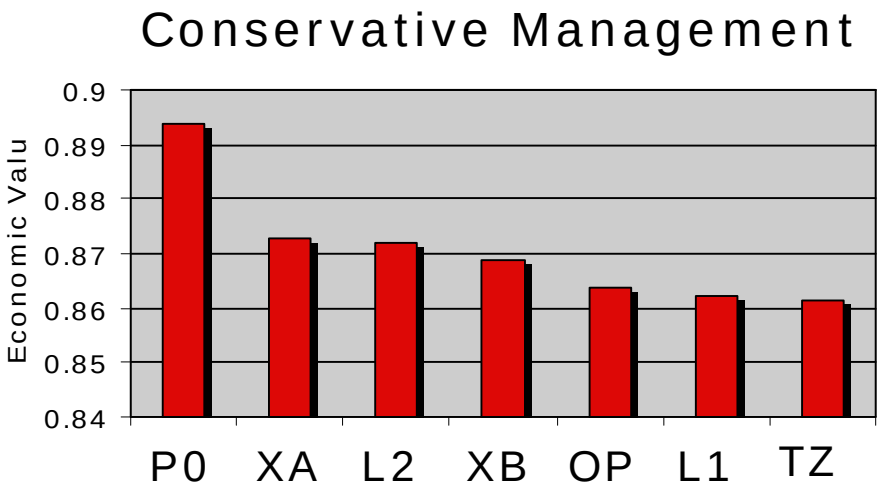


- Rankings are similar across management scenarios, models and choice of fleet model.

Model Results: Proposal Rankings





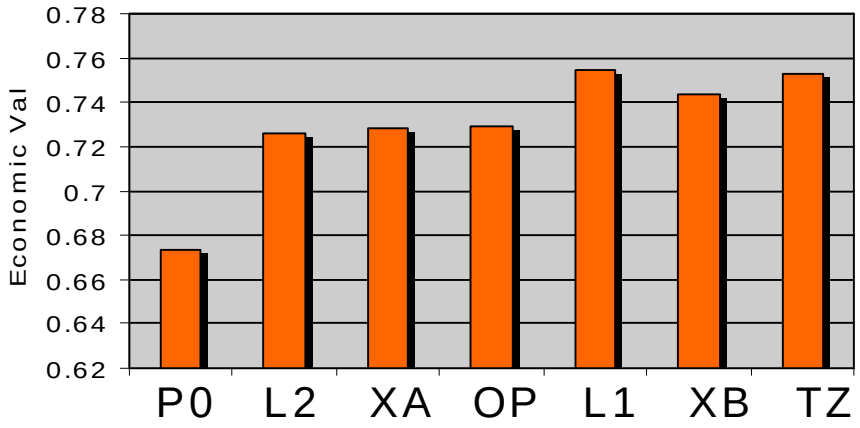


- Rankings for economic value preserved across models and for “MSY-Type” and “conservative management”
- Rankings are reversed under “unsuccessful management.”

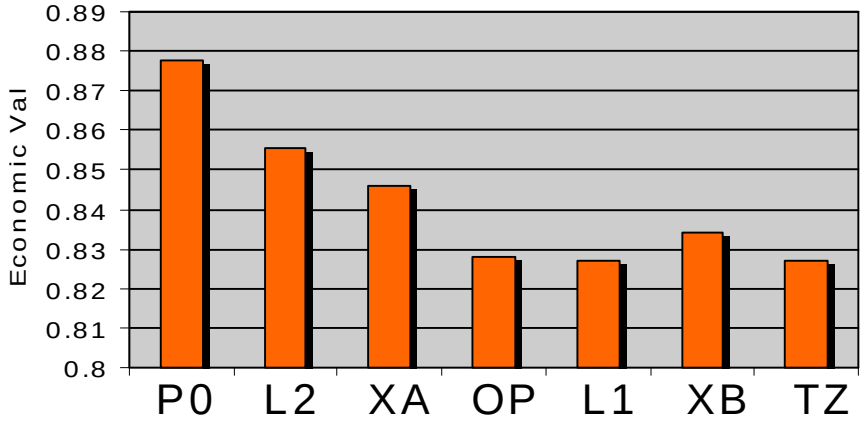
Model Results: Proposal Rankings

New Fleet Model - UCD

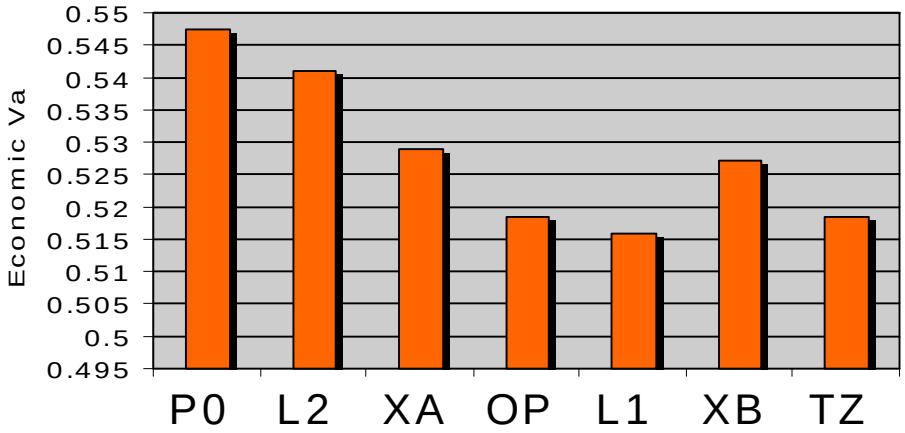
Unsuccessful Management



MSY-Type Management



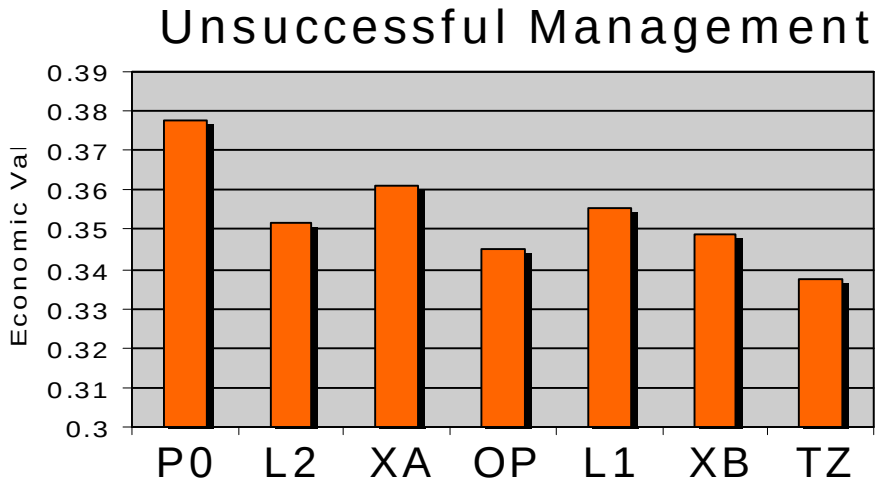
Conservative Management

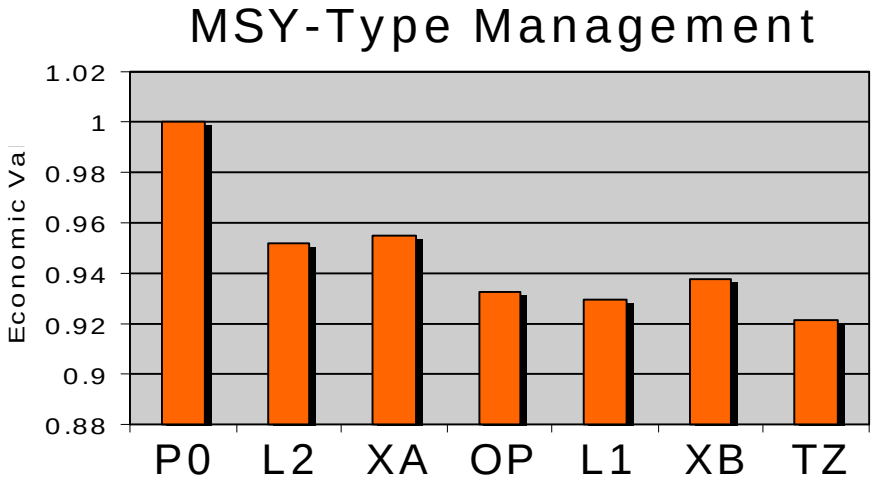


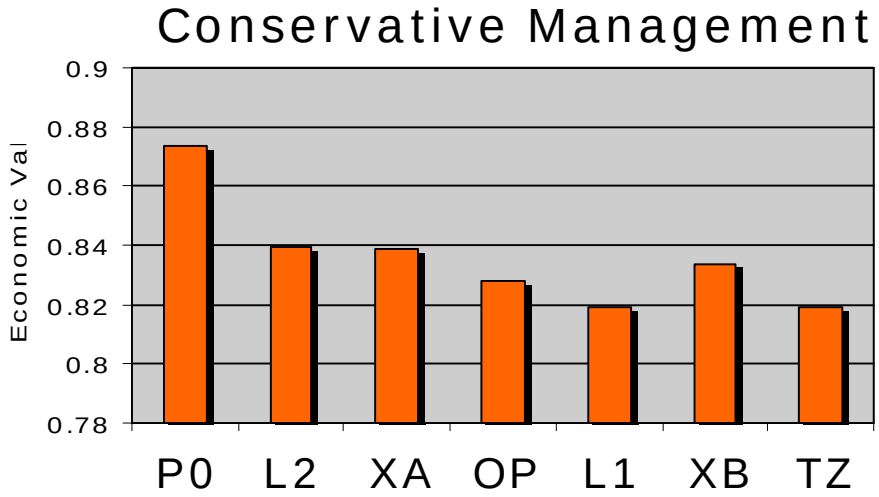
- Rankings are similar across management scenarios, except with unsuccessful management

Model Results: Proposal Rankings

New Fleet Model - UCSB







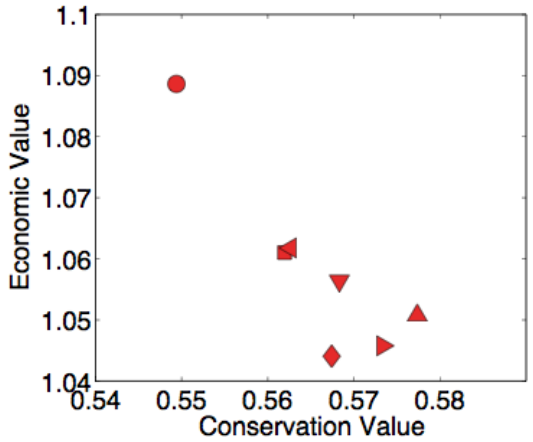
- Rankings are similar across management scenarios, even with “unsuccessful management”

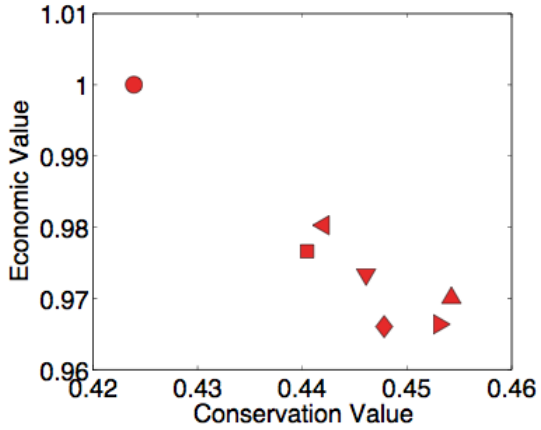
Model Results: Proposal Rankings

Scenario: MSY-Type Management

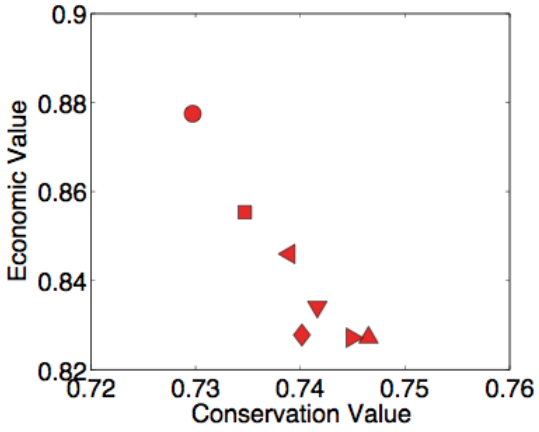
UCD **UCSB**

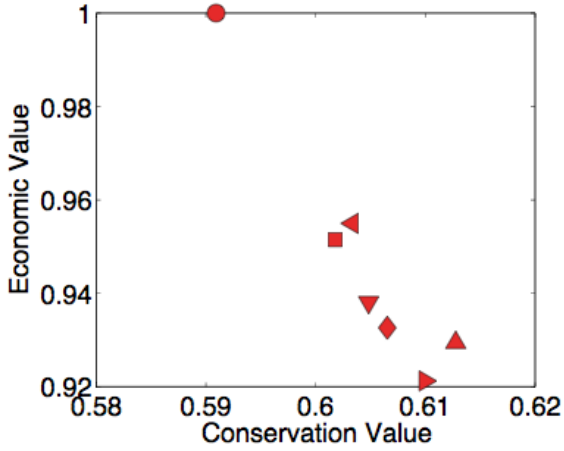
old





new





P0
L1
L2
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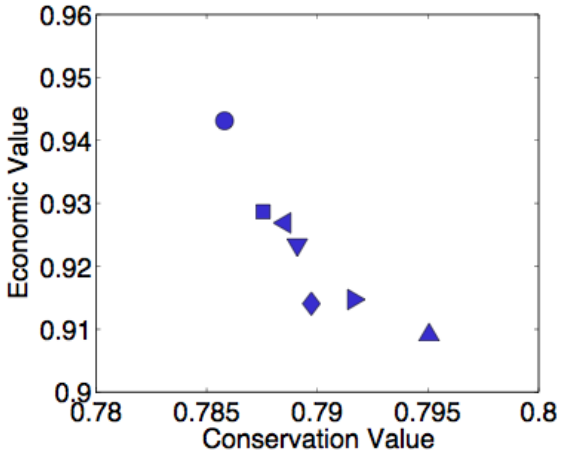
XA
XB

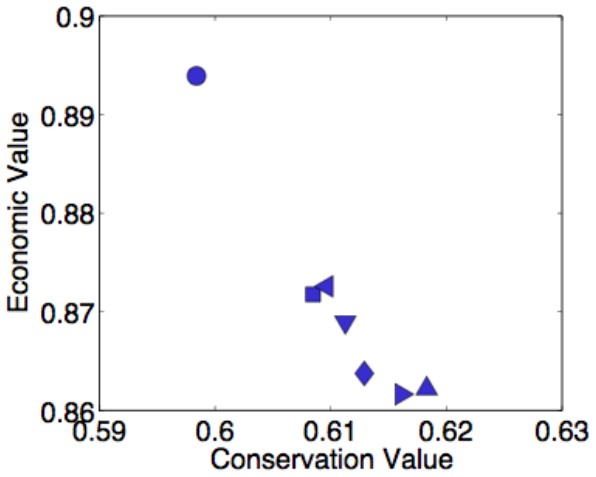
Model Results: Proposal Rankings

Scenario: Conservative Management

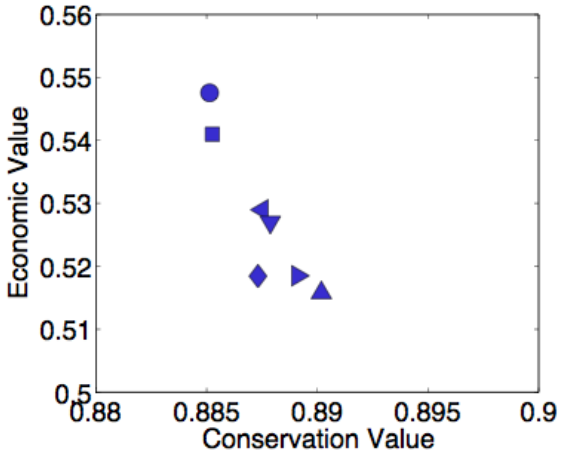
UCD **UCSB**

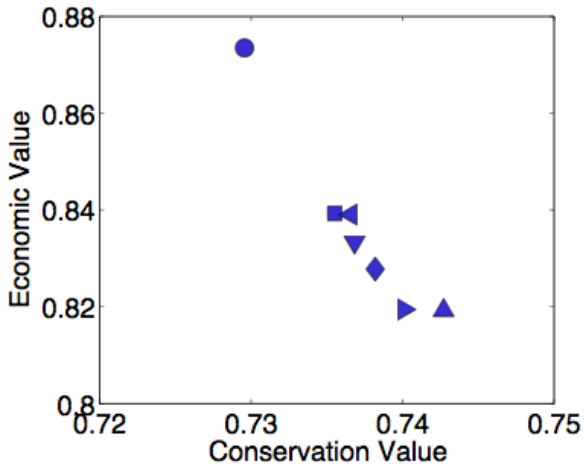
old





new





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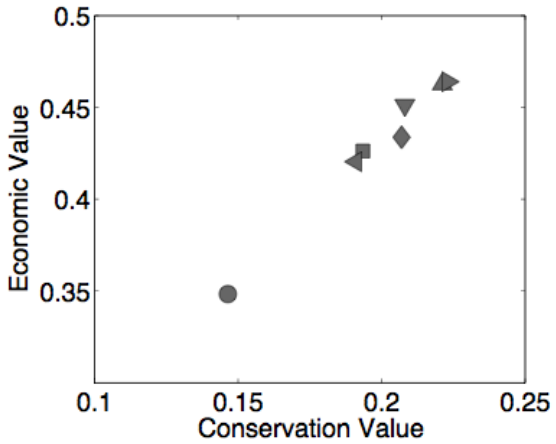
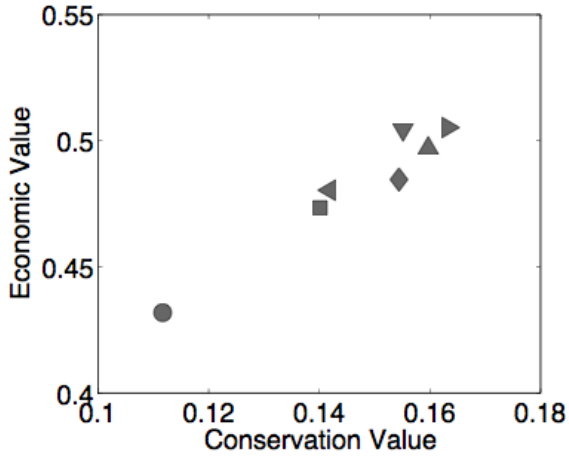
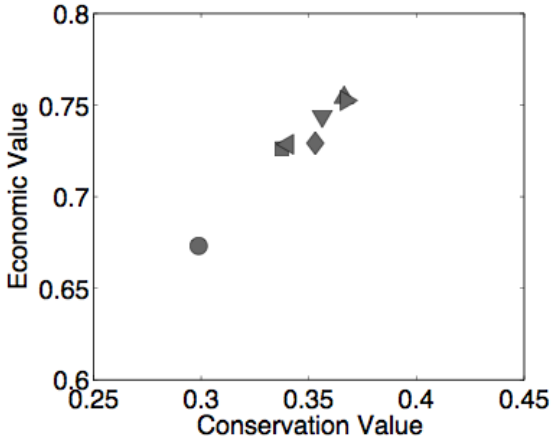
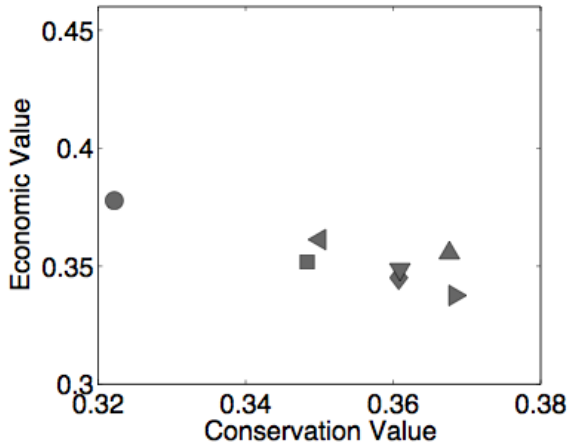
Model Results: Proposal Rankings

Scenario: Unsuccessful Management

	UCD	UCSB
old		
new		

P0
L1
L2
OP
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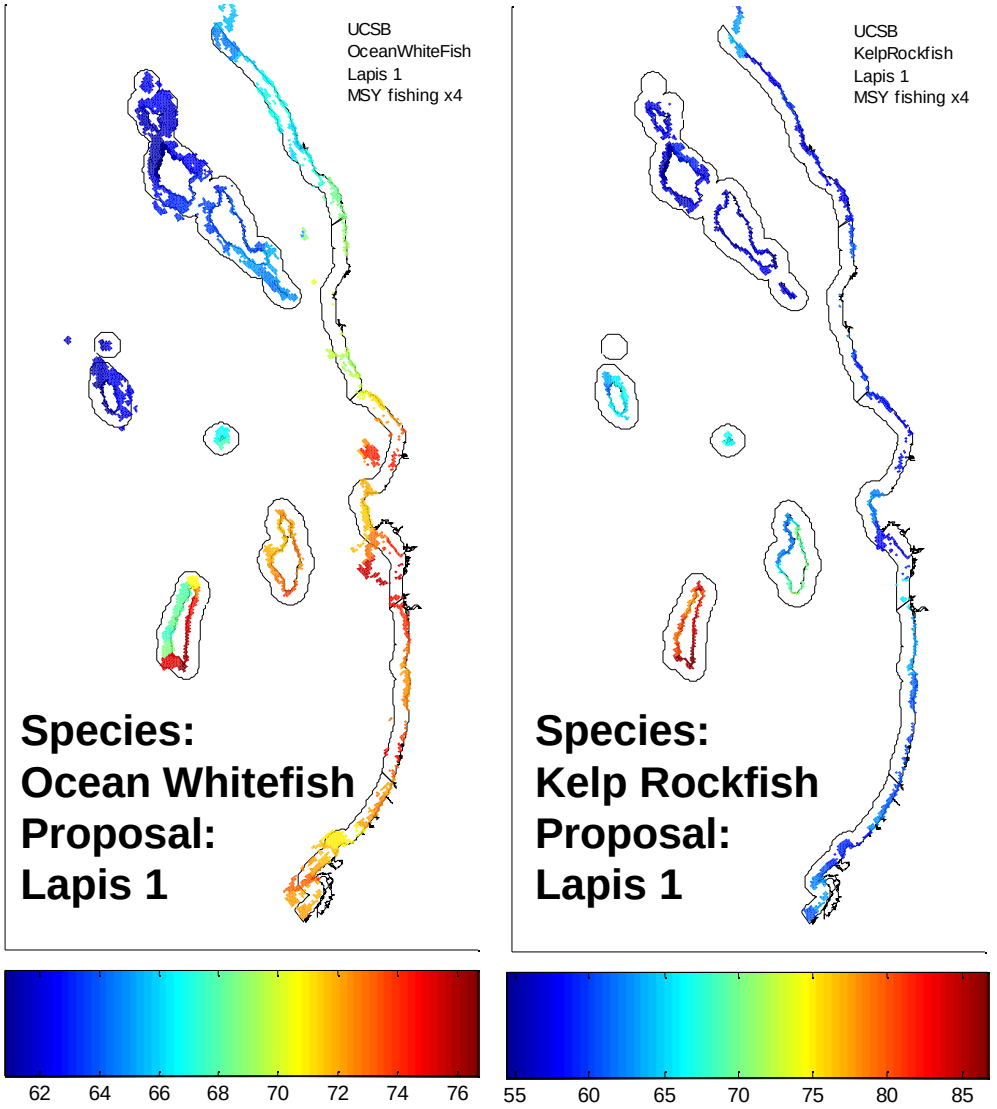
XA
XB

Results: Changes in Settlement

- Maps show percent increase in connectivity, relative to Proposal 0
- Settlement typically increases everywhere with the addition of MPAs
- Lower values could be improved by adding MPA area to source locations
- Maps are available for each species, MPA proposal and level of fishing.



Percent increase in settlement due to proposed MPAs

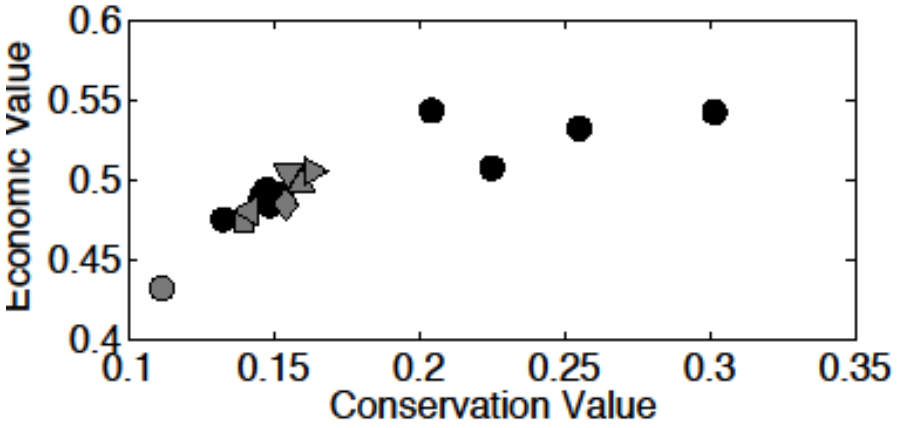
Conclusions

- All model outputs from Round 2 evaluations at MLPA website (www.dfg.ca.gov/mlpa)
- Ranking of MPA proposals for conservation value is relatively insensitive to (1) model, (2) assumption about fishery management and (3) choice of fleet model
- **Lapis 1** or **Topaz** give the highest expected conservation value under all scenarios for both models
- Rankings for economic value depend on (1) management scenario (reversed for unsuccessful management) and (2) fleet model
- **External A** and **Lapis 2** give the highest expected economic value for "MSY-type management" and "conservative management"
- Under "unsuccessful management," **Lapis 1**, **Topaz** and **External B** all gave high expected economic values, except in UCSB's fleet model, where economic values were similar, with **Lapis 1** and **External A** performing best

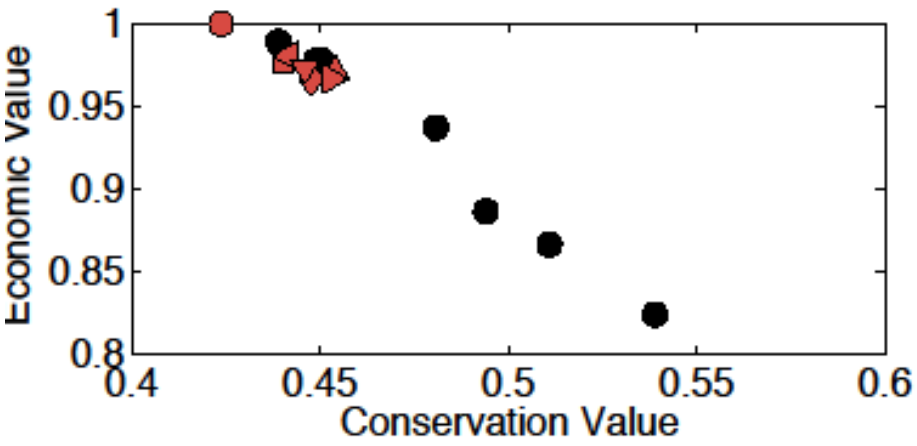
Model Results: Proposal Rankings

Round 2 results in the context of round 1

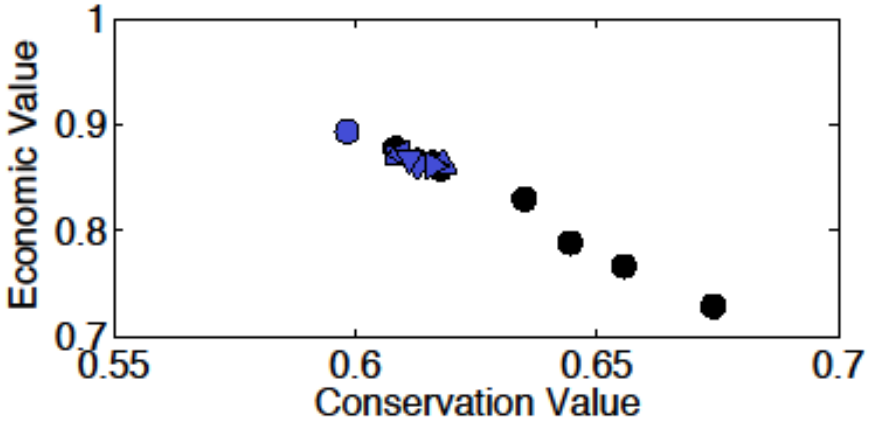
Unsuccessful Management



MSY-Type Management



Conservative Management



- UCSB results with old fleet model